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Introduction

Like many libraries, the Elmer E. Rasmuson Library of the University of Alaska at Fairbanks has been exploring ways to expand access to the growing number of commercial CD-ROM database products, which are supplementing and replacing traditional print and online reference sources in libraries. Over the past few years, we have increased the number of CD-ROM titles in our collection; however, due to the popularity of these databases, the queues to use them also grew, which resulted in patron frustration. This paper will briefly chronicle our library's implementation of a local area network (LAN), which is primarily used to provide multiple-user access to CD-ROM databases.

Background Information

The Rasmuson Library is the largest research and academic library in the state of Alaska. Prior to implementing our LAN, we used a variety of CD-ROM databases. As members of the Western Library Network (WLN), we made the LaserCat CD-ROM database available to patrons for several years. We also provided access to the following CD-ROM databases: Dialog's OnDisc ERIC, University Microfilm's ABI/INFORM OnDisc, and Auto-Graphics' Government Documents Catalog Service. All of these databases were accessible at individual workstations. There were several LaserCat workstations.

Since we were planning to add a few new CD-ROM products each year, it became apparent that we would quickly run out of room for separate workstations dedicated to single databases. We were beginning to see patrons waiting for access to a workstation--or worse--giving up and leaving. At the same time, we had been discussing the need for a local area network to provide access to several local databases we were developing for our special collections. We also saw the need for a LAN to provide some administrative services, such as scheduling facilities and equipment from multiple locations.

In the spring of 1989, we made the decision to develop a LAN throughout the five floors of the library. Our first use of the LAN would be to provide access to our growing CD-ROM collection. We needed both a LAN operating system and a CD-ROM server.

Ethernet was selected as the LAN topology because of its robustness. Having an internal Ethernet would also facilitate the future connection of this LAN to a fiber-optic Ethernet being installed on the campus.

Procurement of the CD-ROM LAN

Specifications were developed after a survey of available CD-ROM LAN systems. (Meridian, Silver Platter, and LANtastic were the major players). The first request for bids went out, but none of the bidders met our specifications. Some bidders obviously had no idea what was involved in networking CD-ROMs. Others simply didn't include all the components we specified. A second request for bids that had more exact specifications was issued. At the same time, we purchased three Hewlett-Packard (HP) 80386-based microcomputers to use as workstations. HP was chosen simply because of a state contract that allowed us to purchase these units without a time-consuming bid process.

The system with the lowest bid that met our specifications was a product developed by CBIS, Inc. of Norcross, Georgia. We purchased a total CBIS package, including their NETBIOS-compatible local area network software (Network-OS), the CD Connection software to run CD-ROM databases over the network, and a CD Server/386 with an 80386 processor. Frankly, we had expected Meridian Data to be the successful bidder. At the time we began looking into CD-ROM networks, CBIS was a new and untested player in the CD-ROM networking marketplace, while the Meridian Data CD Net system had a track record.

Initially, we resisted the CBIS bid, which was made by a local vendor. However, as a result of discussions with CBIS sales and technical people, we decided that CBIS was offering a workable system. A cautionary note for anyone entering this arena: the local vendor we purchased the system from had no prior knowledge of CBIS products. Their relationship with CBIS was established when they received our bid.

Technical Support and Documentation

In our estimation, the quality of the technical assistance our local vendor provided ranged from poor to nonexistent. At one point, they gave information concerning the system that was simply erroneous. CBIS offers free technical assistance to all registered users; our local vendor wanted to charge by the hour for technical assistance. We have ended up getting telephone support directly from CBIS technical staff.

For the most part, we have found CBIS assistance to be prompt and accurate. After several calls, we identified the staff most responsive to our needs. When we call now, we request these staff by name. A few things, like a simple list of CD-ROM

products that have successfully run on the CBIS system, took a number of calls and some cajoling to obtain. Part of the problem was that the product was so new that some information has simply not available in a form suitable for customer use. The CD Connection manual didn't provide as much helpful information as we would have liked, especially about trouble shooting. The information was simply not there. We understand that CBIS is working on an updated and expanded manual.

The moral of this brief tale is to be wary about who you purchase a CD-ROM LAN system from. In many cases, you will know as much, if not more, than a local vendor. Chances are that, unless CD-ROM LAN activity is high in your area, you will be a local store's only customer. This gives the local vendor little incentive to spend much time training its staff to service the CD-ROM networking product. Even if you deal directly with the manufacturer, networking CD-ROMs remains new enough that complete documentation may not be available. Although CD-ROM LAN systems are proliferating and some installations are several years old, the library community is probably somewhere near the end of the early adopter stage of CD-ROM LAN use.

Network Hardware

The hardware for our CD-ROM LAN is fairly straightforward. Table 1 provides specific information about network servers and workstations. We decided to try a mix of workstations to see what hardware gave the best performance at the lowest cost.

Table 1. Network Hardware.

1. Network Server.

25 MHz, zero-wait-state, 80386-based microcomputer with 4 MB of memory (1 MB DOS, 1 MB RAMdisk, and 2 MB cache); 1.2 MB, 5 1/4" disk drive; 40 MB hard disk; amber monochrome monitor; dot-matrix printer; and Accton 8-bit Ethernet card.

2. CD-ROM Server.

25 MHz, zero-wait-state, 80386-based microcomputer with 4MB of memory; 1.2 KB, 5 1/4" disk drive; amber monochrome monitor; and 8-bit Western Digital 8003 Ethernet card.

3. Workstations.

Four 4.77 MHz, 8088-based microcomputers each with 640 KB of memory; 2 360 KB, 5 1/4" disk drives; 20 MB hard disk; CGA monitor; dot-matrix printer; and 8-bit Accton Ethernet card.

Two 12 MHz, 80286-based microcomputers each with 1 MB of memory;

360 KB, 5 1/4" disk drive; 40 MB hard disk; VGA monitor; dot-matrix printer; and 8-bit Accton Ethernet card.

Three 20 MHz, 80386-based microcomputers each with 1 MB of memory; 1.2 MB, 5 1/4" disk drive; 1.4 MB, 3.5" disk drive; 40 MB hard disk; VGA monitor; dot-matrix printer; and 8-bit Accton Ethernet card.

Network-OS can operate as a peer-to-peer or dedicated server system. Thus, any node on the network may function as only a workstation, a dedicated server, or a combination server and workstation. Network-OS does not require a dedicated server to run the network; however, response time is so sluggish with a non-dedicated server that trying to save a few dollars this way may negatively affect users' attitudes towards the system, not to mention overall system performance. The CD Connection machine must be a dedicated server.

Our CD Server/386 does not require a hard disk. The server has seven Hitachi CD-ROM drives--the maximum number of CD-ROM drives that can be in the machine. A CD Server/SU tower is attached to the CD Server/386. This unit contains seven more Hitachi CD-ROM drives. At this time, we have eleven of the fourteen drives loaded and operating over the LAN. Since installation in January, we've had to replace one of the Hitachi drives (it was still under warranty). CBIS has recently switched to NEC CD-ROM drives. The CD Server/386 can operate with two extension towers, for an total of 21 CD-ROM drives. Although CBIS assures us we will see no degradation in performance, I remain skeptical that the CD Server/386 can adequately run 21 CD-ROM drives with the same level of performance as when it is running 7 drives.

Having run the network for four months with a mix of microcomputer workstations, we can make the following recommendations about minimum workstation hardware for similar CD-ROM LANs.

XT-class machines are simply too slow. Up to 30 or 40 seconds can pass while you wait for a database to load. Basic workstation memory (640 KB) is barely adequate for CD-ROM applications on the LAN. Adding extra memory to the XT-class machine is time consuming--XTs were simply not designed with this kind of expansion in mind.

A minimum of 1 MB memory is needed for each workstation. Be wary of how that 1 MB is divided up. The 80386-based HP machines we purchased have 1 MB of memory, but the memory above 640 KB is called "reserved" memory. Basically, this means it is reserved for machine-specific functions like the ROM BIOS and video drivers. We are unable to load any application software (like our network menu program) in that memory space.

We believe that a minimum workstation configuration is a 12 MHz 80286-based microcomputer with 1 MB memory, a hard drive (40 MB seems to be standard in new machines lately), at least one floppy drive for loading software and giving patrons the option of downloading search results, and a VGA color monitor. When budget permits, our preference is to go with 80386-based workstations. As prices come down on these units, they may become our basic workstation. We prefer VGA color monitors because most CD-ROM databases have wonderful interface screens that look best on VGA monitors. Having a high-resolution screen display can reduce eye fatigue, especially for long CD-ROM sessions.

We feel that having printers available on CD-ROM LAN workstations is also important. Each workstation on our LAN includes a 9-pin, dot-matrix printer. As the number of workstations grows, we may explore sharing a printer among a cluster of three or four stations; however, we feel that having dedicated printers for each workstation is easier for patrons. Although we haven't done a time study, our sense is that dedicated printers reduce the total time that users spend at workstations.

Network Software

Table 2 gives a summary of the network software we are using to support LAN operations. We also tried Borland's Sprint word processing software, which successfully ran on the network.

Table 2. Network Software

1. CD Connection (CBIS)

2. MSCDEX (Microsoft)

3. Network-OS (CBIS)

4. PC Anywhere (DMA, Inc.)

5. Perfect Menu (International Computer Group)

I've already mentioned that we are running Network-OS, a NETBIOS compatible package, as the LAN operating system. If you are familiar with MS DOS, this is an easy package to install and maintain. However, I don't mean a passing acquaintance with DOS, but an intimate and loving relationship. Fortunately, we have a person on our staff who has such a knowledge of MS DOS. This has made life on the LAN front much easier. We had the network running the same day we installed the Network-OS software. It took a little over a day to install the CD Connection software on

two workstations, and about one week to get it fully operational. All this activity was preceded by several days of reviewing the manuals.

It was the small things that slowed us down. For example, the Ethernet cards, which were supplied by CBIS, contained no documentation, and we had to experiment to find out what the cards' configurations should be. A call to CBIS requesting documentation brought no results.

When we needed additional Ethernet cards, we went directly to the card manufacturer and purchased the cards at the same price that CBIS had charged us. Each card from the manufacturer came with a manual and diagnostic software.

We installed Perfect Menu to use as a network menu system. It provided a good user interface, had good security, and was easy to modify. It could operate in resident or nonresident mode. Nonresident mode is an option if memory is tight, but it really slows down performance as you wait for the software to unload and load before and after you use a CD-ROM database. On 8088-based workstations, operating Perfect Menu in nonresident mode gives you time to get a cup of coffee while the menu comes up. We run the main menu functions off the network server.

Perfect Menu provides some useful utilities such as metering, which allows us to limit the number of workstations that can simultaneously access a CD-ROM database. This may prove helpful for CD-ROM vendors whose licenses restrict the number of simultaneous users of their products. We also make use of a timeout feature, which allows us to shut down the network at night and turn it back on the next morning. Perfect Menu also provides some user statistics, such as the total time an application was loaded at a workstation.

Currently, we are installing a remote workstation at our Biomedical library, which is about one mile from the main library. We are using the PC Anywhere software to support this workstation. This software allows a remote computer to access the network through any network node that is running a copy of PC Anywhere and has a communications port. Using two LAN drivers, we have connected our Biomedical library workstation via a dedicated line to a LAN workstation in the main library. Essentially, the remote computer will use this LAN workstation as a slave unit. We will also use PC Anywhere as way to provide dial-access to the network.

This remote-access arrangement for our Biomedical library is an inelegant solution at best. When a campus-wide fiber optic LAN is installed, we will replace the current remote-access method with a direct connection via the fiber optic LAN. In the meantime, we will experiment with PC Anywhere.

We are deciding whether or not to continue to use the Network-OS operating system. On the positive side, Network-OS, which has an MS DOS base, has been fairly easy to install and maintain. On the negative side, the software doesn't have all the features that a network operating system such as Novell Advanced Netware offers. For example, we had to purchase a separate menu software package (Perfect Menu) to provide a reasonable user interface. Netware comes with a built-in menu utility. There are also inherent memory limitations in an MS DOS environment. My personal preference would be for a UNIX system. However, it is still difficult to use CD-ROM databases with UNIX.

Installation of CD-ROM Databases on the Network

Loading CD-ROM databases on the network was been done on a case-by-case basis. Some CD-ROM databases worked immediately, some didn't run at all, and others required considerable tinkering before they ran. We often found that claims of compatibility between CD Connection and specific CD-ROM databases were only partially true. For example, we were told that the Cambridge Scientific products would run on the LAN. Indeed they did, but only if the CD-ROM database in question was in the first drive in the server. This was fine--until we had another CD-ROM that also required placement in the first drive. Working with both CBIS and Cambridge, we have finally overcome this limitation, and soon we will be mounting two Cambridge CD-ROMs on the LAN.

Table 3 shows the CD-ROM databases that we have tested on the network. Only ABI/INFORM OnDisc has failed to run on the network.

Table 3. CD-ROMs Tested on the LAN

1. ABI/INFORM OnDisc (UMI)

2. Aquatic Sciences & Fisheries Abstracts (Cambridge Scientific)

3. Government Documents Catalog Service (Auto-Graphics)*

4. LaserCat (WLN)*

5. Life Sciences Collection (Cambridge Scientific)

6. Magazine Index Plus (Infotrac)

7. OnDisc ERIC (Dialog)*

8. Reader's Guide to Periodical Literature (Wilson)

* Software currently runs on workstations

University Microfilm's CD-ROM products have been a perplexing problem. I've seen the UMI products running on a LAN; however, none of their CD-ROMs would run on the CBIS system. It was only after we had the LAN operating that UMI and CBIS exchanged software to try to achieve compatibility. This did not seem to be a high priority for either of them, so we call them regularly to remind them of our need.

Currently, the UMI CD-ROM databases are still not working with the CBIS system. We have the ABI/INFORM OnDisc CD-ROM locally loaded at one workstation. This workstation has access to all other databases on the LAN, except LaserCat. The LaserCat software conflicts with the UMI software.

Providing LAN access to CD-ROMs from different vendors can be challenging. Unless they employ CD-ROMs from different vendors, tests reported in the literature and vendor demonstrations may not give you an accurate picture of CD-ROM network products. What runs well in an single-vendor CD-ROM LAN could cause problems in a multiple-vendor LAN. Part of the problem may stem from the original design of CD-ROMs as single-user products. Some CD-ROM software packages are still not ready for a multiple-user, multiple-product LAN environment.

Of the CD-ROM products we have tried, those by Auto-Graphics (Government Documents Catalog Service), Dialog (OnDisc ERIC), and Infotrac (Magazine Index Plus) have run immediately without problems. Products by WLN (LaserCat), Cambridge Scientific (Life Sciences Collection and Aquatic Sciences & Fisheries Abstracts), and Wilsondisc (Reader's Guide to Periodical Literature) have run after some manipulation on our part and calls to CBIS and the CD-ROM vendor. LaserCat in particular drinks up memory like a thirsty man in Death Valley. Occasionally, parts of the LaserCat program remain in memory after the program has been unloaded, reducing available memory at the workstation. The only way out of this situation is to reboot of the workstation.

Our biggest problem with getting CD-ROM products to run on the network has been loading and unloading MSCDEX. Some software packages require MSCDEX on each workstation, others don't. Trying to save as much memory as possible, we don't want anything loaded that doesn't have to be in memory. A few utilities are available to unload MSCDEX automatically, but they also reboot the machine--a condition we don't want on the LAN, particularly if the machine being rebooted is a server. Currently, the only CD-ROM software we run on the network server is the searching software from Cambridge Scientific. We are close to solving the automatic loading and unloading of MSCDEX, but this effort has

required intensive work with DOS.

Our main approach to CD-ROM vendors is to tell them that a requirement for purchasing or subscribing to their product (or continuing to do so) is that it run on our LAN. While some compatibility problems persist, I believe most of them will be resolved.

The larger problem is obtaining CD-ROM LAN licenses. Pricing for these licenses has been all over the board, from no extra charge, to blanket-license fees for x number of workstations, to a per-workstation charge, to doubling the subscription fee (we returned that CD-ROM). Some license agreements extend only to LANs operating within a single building. Some vendors with this restriction have allowed us to include our Biomedical Library. Soon, we will run into problems as we try to extend access to our LAN beyond the confines of our immediate campus.

In short, CD-ROM producers are not yet prepared to handle network license agreements for their products. I see licensing as the critical problem facing CD-ROM networking. The rest of the problems are technical issues which, while momentarily vexing, are not unexpected given that this is a new technology. I believe those vendors who do not adapt their products, their fee structures, and their licensing agreements for a network environment will see their market share shrink.

Conclusion

We have been satisfied with our excursion into the world of CD-ROM networking. We currently have five public workstations up, a workstation at our reference desk, one in our online searching room, and two in administrative offices. Soon, we will have a remote site at our Biomedical library. Our plans are to expand both the number of workstations and the number of CD-ROM databases. Our current strategy is to add multiple copies of a CD-ROM database if and when demand for that database slows down network performance. We also plan to install a bridge to the campus-wide LAN and a dedicated communications server with multiple dial-up ports. We have already placed an order for another CBIS server.

User response has been extremely positive. With little fanfare and minimum help, our patrons appear have taken to the LAN well. We are developing easy-to-use online help screens and integrating the use of the LAN into our Library Skills course. Generally, if a user has no problems utilizing a microcomputer, the user has no problem employing the LAN.

The CBIS system we installed has worked fairly well; however, we are fortunate to have experienced technical people on our staff. CD-ROM network systems are not yet turnkey operations. I did not discuss the work involved in installing the LAN itself. We spent

as much time installing cable as we did installing software and hardware.

CD-ROM producers are only slowly responding to the new world of CD-ROM networking. Their actions will greatly influence how quickly or how slowly libraries progress with CD-ROM networking. Hopefully, we can all work together to make CD-ROM networking a commonplace reality.

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